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THE UNIVERSITY OF ALBERTA

Appropriate Technology: Education and the Oxfam Farmers' Brigade in Nicaragua

by

Peter M. Gamache

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The undersigned certify that they have read and recommend to the Department of Rural Economy, for acceptance, a paper entitled Appropriate Technology: Education and the Oxfam Farmers' Brigade in Nicaragua submitted by Peter M. Gamache in partial fulfilment of the requirements for the Degree of Master of Agriculture in Agricultural Economics.

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Supervisor

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Leonard Bauer

Dated August 17, 1989

ABSTRACT

Nicaragua is a country in the early stages of development and agrarian reform. Co-operative farms in an attempt to become more efficient and to produce more food were mechanized in the early 1980's. The rapid introduction of tractors and other farm machinery has resulted in problems which technology often causes in third world countries. The Farmers' Brigade, seeing the need for mechanical help, has been supplying tools and spare parts, repairing farm equipment and teaching machinery maintenance on Nicaraguan co-op farms. Teams of Canadian farmer volunteers also built a stationary machine repair shop and a mobile repair shop. The training aspect of the Farmers' Brigade project was evaluated using the criteria of appropriate technology. Ten trainees and six co-op leaders were interviewed as part of a larger evaluation of the Brigade work. The Brigade training was scored low when measured by the criteria of appropriate technology. The change in Brigade objectives from repair to education may have lessened the Brigade's effectiveness since its members were not trained as teachers. The Brigade training was not a priority with the Nicaraguans. The inappropriateness of the tractorization effort raised questions about the training project. The Brigade training period was short and the conditions in war torn Nicaragua were difficult.

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Chapter One

Introduction

The rapid introduction of tractors and other farm machinery which occurred in Nicaragua in the 1980's has resulted in problems and change for rural people. The Oxfam Farmers' Brigade has been providing spare parts and tools, repairing farm equipment and teaching maintenance skills to Nicaraguan farmers since 1985. This paper examines the Brigade training program using the criteria of appropriate technology.

The transfer of first world technology to third world countries has often caused social, environmental and economic problems which impede realization of the potential of the technology. These difficulties arise in part because the choice of technology is inappropriate to the new setting. Appropriate technology seeks to avoid or reduce problems, to help people adapt and to develop technology that is suitable to their needs. Closely associated with appropriate technology is appropriate education technology and training to facilitate the transfer.

Objectives

The focus of the paper is on three problems: a) the appropriateness of the Farm Brigade training program, b) the effectiveness of the annual changes in the Brigade's objectives and c) the Nicaraguan perception of the usefulness of the Brigade's work. These problems are

influenced by the issue of whether the technology used to mechanize Nicaraguan farms is appropriate. However the appropriateness of mechanization is not the focal point or issue of the report.

The objective of this project is to determine whether the education and training that the Farm Brigade has provided in Nicaragua for co-op farmers is appropriate in the light of criteria for appropriateness.

Over seventy Canadian farmers have invested time and effort in the Nicaraguan project. Slightly over $500,000 has been budgeted for the various projects during the period of 1985 - 1988.

The objectives of the Brigade have changed each year which raises questions as to the direction of the project and the appropriateness of the work that has been done. The criteria of appropriate technology allow the training aspect of the Brigade's work to be examined more closely.

Outline

The first part of the paper will provide background information on the situation in Nicaragua and an overview of the Farm Brigade work since 1985. A discussion of the philosophy, meaning and criteria of appropriate technology, technology transfer and education will establish the framework to analyze the appropriateness of the Brigade training program. The next sections examine the methods, analysis of the data and the results. The paper concludes

with an interpretation of the results and observations.

Chapter Two

Background to Nicaragua and the OFB Project

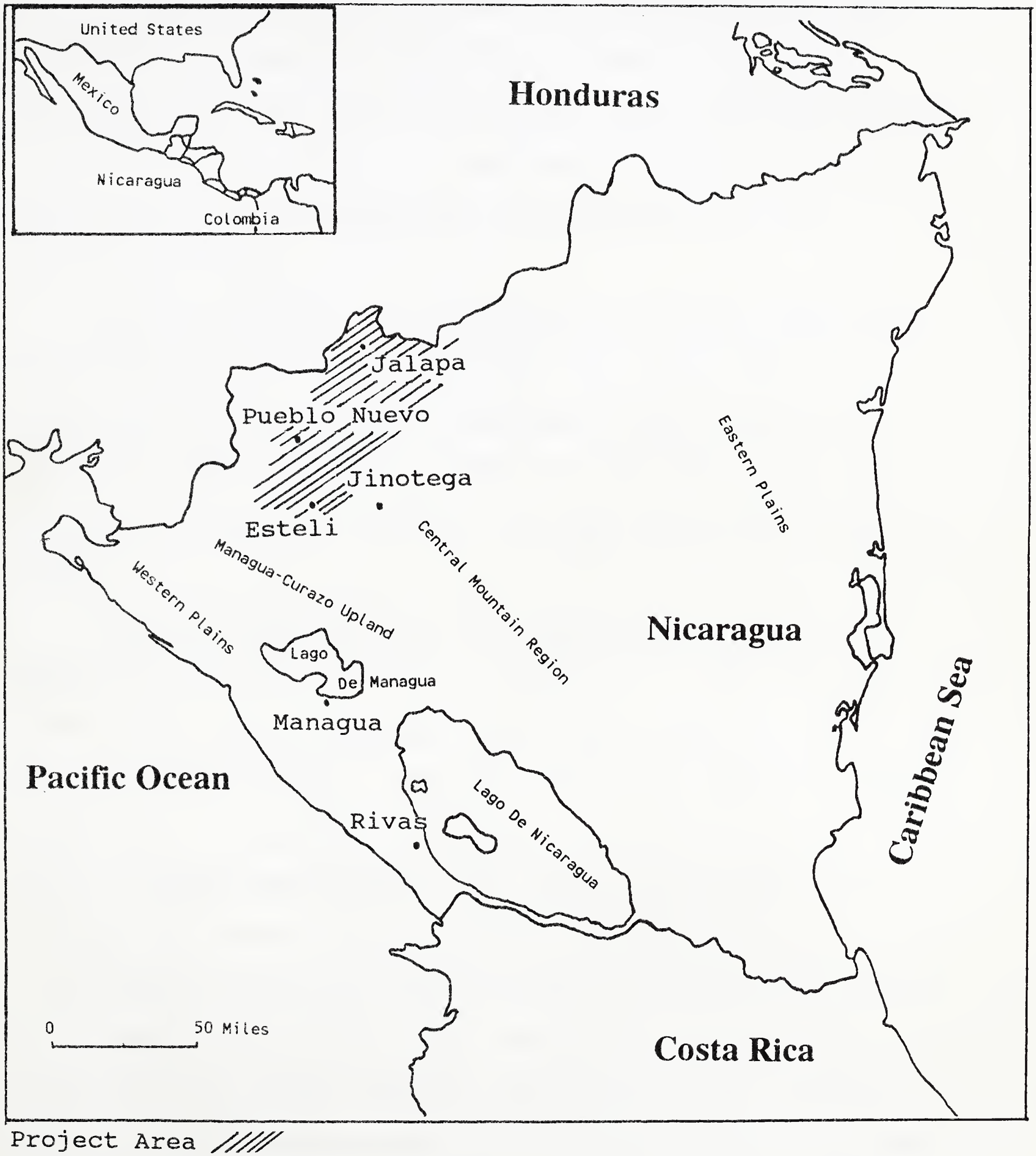
Nicaragua

Nicaragua is the largest Central American country with an area of 127,849 square kilometres (Paxton, 1989). It is bounded on the north by Honduras and the south by Costa Rica (Figure 1). The 1987 population was 3.5 million with about 850,000 people in greater Managua, the capital. It is the least densely populated Central American country with 30 inhabitants per square kilometre, although about 60% of the population lives along the western coastal plain (Colburn, 1986).

The climate is tropical but there is considerable variation due to the topographical variety in the country. The western plain, Managua-Carazo uplands, central mountain region and eastern plains are the major areas. Rainfall can be very variable with a wet season from May to January.

Agriculture forms the mainstay of the economy and employs about 65% of the labour force (Paxton, 1989). Most of the agricultural production is in the western half of the country. Corn, rice sorghum, cotton, beans, coffee and sugar cane are the principal crops. Livestock and forestry are also important activities. Approximately 17% of the agricultural land is owned by state farms, 8.8% by co-operatives and the remainder by individual private owners (Collins, 1986). The total area in farms and ranches is

Figure 1 **Map of Nicaragua**



about 13.9 million acres. There are approximately 2 tractors per 2500 acres of farmland according to USDA figures for 1986 (USDA, 1989).

Warnken (1975, p. 32) described pre-revolution crop production as dualistic in nature. A small number of producers operated large units, used high technology levels and produced for export. A large proportion of the farmers produced for domestic markets and utilized very low technology levels.

The total value of agricultural production following the revolution in 1979 has fallen to 81.7% of the 1979-81 index of 100 (USDA, 1989). Nicaragua's self-sufficiency ratio in 1985 was 76% for cereals and 91% for food. The ratios for 1975 were: cereals 103% and food 108% (USDA, 1989).

The volume of domestic food production (rice, corn beans and sorghum) increased substantially from 1975 to 1985. Rice output increased 202%, beans 140%, corn 131% and sorghum 457% (Collins, 1986, pp. 273-279). However export production has generally decreased over the same period. Raw cotton output decreased to 39%, sesame to 91% and coffee to 89% of 1975 levels. Banana production remained stable while sugar cane output increased to 109% and tobacco to 145% of 1975 levels. About 42% of the 1985 acreage of the major crops was for export purposes while 58% was for domestic crops. The purchasing power of Nicaragua's exports in 1985

was one-half of the 1972 level.

Nicaragua has for many years been a country controlled by rich landlords and a few elite. The poor were mostly illiterate and landless. The Sandanista revolutionaries overthrew the Somoza regime in 1979 and have been attempting to change these injustices. A long and difficult struggle with the Contras (counter-revolutionaries) and a faltering economy have slowed the regime's progress towards a better life for the people of Nicaragua.

Shortly after the revolution the new government sought to bring about a number of reforms especially in agriculture. Jaime Wheelock, Minister of Agrarian Reform said, "If we don't make radical changes in the structure of agricultural production, the location of production, land tenancy and technology, we are finished" (Oxfam Canada). In this context the move to mechanize farming was started. Since Nicaragua has no oil or proven oil reserves and very little industrial capacity the only choice for machinery and supporting services was to import. The Soviet Union has met most of this need and Nicaragua is still very dependent on foreign imports and assistance to keep farm mechanization alive.

Land reform has been a major part of agrarian reform. After the revolution the government confiscated the Somoza family holdings amounting to over 20% of the agricultural land. State farms, co-operatives and small and medium size

producers have all benefited from redistribution of this land. The trend in the early 1980's favoured state farms but by 1985 the small to medium producers and co-operatives were receiving most of the newly redistributed land.

Co-operative farms were established in the early 1980's as a result of land reforms instituted by the new government. People, particularly in border areas, were settled on land which had been farmed extensively and was poorly developed. Conditions were primitive, transportation marginal and facilities such as electrical power, hospitals, services and roads were lacking. Small, narrow valleys and steep hills characterize much of the area devoted to co-operatives. At the same time as the co-ops were becoming established, the government decided to mechanize agriculture and the co-ops were given tractors. Motorized equipment was almost totally lacking before the tractors were received. Most co-op members were former farm labourers and had no mechanical experience.

The co-op farms serve not only to develop agriculture but also to help in civil defense in the war with the Contras.

Oxfam Farmers' Brigade Project

The Farm Brigade Project developed out of a visit to Nicaragua in March 1984 by Irving Bablitz, an Alberta farmer. He and Leonard Buckles, an Oxfam volunteer, spent ten days in Nicaragua with UNAG (the Union of Farmers and

Small Ranchers) assessing the needs in machinery repair and how Canadians could help. The conclusion was that Nicaragua had a real need for agricultural technical assistance and that Canadian farmers could play a part in training technicians and farmers in machinery repair. The Brigade was organized and funded through Oxfam Canada, government and contributions from Brigade members and the public. Brigade groups usually consisted of three to eight members who spend from four to eight weeks living and working in Nicaragua. Most Brigade members have been farmers from Alberta and Saskatchewan who took time in the winter months to travel to Nicaragua.

The first brigade groups went to Nicaragua in early 1985 and eighteen Canadian prairie farmers built a Canadian style machinery repair shop in Rivas in southwest Nicaragua. The project took about two months to complete.

Two brigades went in 1986 to build a mobile repair shop which it was felt would reach more farms than the stationary shop. Over a twelve week period in early 1986 the brigades were able to build the mobile repair shop, conduct repair work and instruct in maintenance and repairs.

The third year (1987) the Brigade focused on training co-op farmers in preventative machinery maintenance and training to increase the efficiency of use of machinery on the farms. Three brigade groups spent six weeks each in the Pueblo Nuevo area in northwest Nicaragua. Training classes

in machinery maintenance and operation were conducted on co-op farms in the area.

Several brigade groups returned to Nicaragua in 1988 to continue a similar program in the Jalapa area.

The Farm Brigade and Oxfam reduced involvement in Nicaragua in 1989 and instead sent a team to evaluate the work of the past four years. Throughout the period of 1985 - 1989 the Brigade continued to supply spare parts and tools to Nicaragua. It also supported the activities of the mobile shop.

This report focuses on the training and educational aspect of the Farm Brigade work. The goal of the Brigade in 1987 and 1988 was to teach preventative maintenance of farm machinery. A preventative maintenance manual was produced and small groups of Brigade members conducted training classes on co-operatives near Tola and in the Jalapa valley. Maintenance training and machinery operation was taught using lectures and hands-on practice. Co-operative members for training were selected with the help of UNAG and the co-operatives.

Classes were usually conducted three times per week at each co-operative farm. There were from one to six students at most sessions. A team of two Brigade members one of which could speak Spanish conducted each session. Tractor maintenance and operation was taught using the machinery available at the co-op farm.

Chapter Three

Concepts of Appropriate Technology

Introduction

Appropriate technology has grown from a relatively unknown concept in the 1960's to a commonly used term in the literature of development. The concepts of E.F. Schumacher and the term "intermediate technology" gained popularity through his book Small is Beautiful and were the start of the appropriate technology movement.

Webster (1984) notes that the keys to Schumacher's philosophy are simplicity, cheapness, smallness and non-violence. The writings of Nyerere and Gandhi have influenced Schumacher. Carr (1985) notes that these concepts have been part of the philosophy and writings of the world's great 'thinkers' throughout the ages.

The concepts of appropriate technology are both normative and objective. Appropriate technology developed as a means of making technology(ies) workable, linking the concepts of efficiency and equity.

Evans and Adler (1984) summarize the principal issues concerning the aspects of the utilization of the technology that form the themes of equity and efficiency in the appropriate technology concept:

1) The exponential depletion rate of the earth's natural resources, the finite nature of these resources, and the consequent requirements to

immediately balance use with supply;

2) The threat to the environment as a consequence of careless wasteful development of resource conversion processes, based on rapidly depleting fossil fuels,

3) Burgeoning world populations, especially in the poorer countries and the impact of this on food and resources supply, and the effect on the quality of life including the problems of large-scale urbanization trends,

4) The inequitable distribution of the world's wealth, resulting in persistent poverty on a major scale, and untenable discrepancies between the affluent and the poor,

5) Inappropriate allocation of capital, with disproportionate shares going for production of consumer products of low marginal utility while, investment that would benefit more people, increase industrial productivity and provide necessary public services goes unrealized,

6) The alienation of man from his natural habitat and his establishment in surroundings alien to his nature, critically short of meaningful employment and demeaning to the spirit,

7) The questions raised by behaviourists concerning the self-determinative capacities of man and the implications this has for development strategies; and

> 8) The oftentimes negative role that technology has played in creating these conditions and the present requirements for redirecting existing technology and for developing new technology that will be consonant with development needs as they are perceived in the humanistic/conservator context. (pp. 41,42)

These eight statements explain the philosophical approach that is the foundation of the appropriate technology movement. According to Frost (1978) Schumacher concluded that poverty was the over-riding problem in third world countries, a problem not being solved by conventional aid but better tackled by the correct choice of technology. It is in this context that Schumacher conceived his ideas of intermediate technology which might be considered a type of appropriate technology (Evans & Alder, 1979).

It is also evident that those committed to appropriate technology would consider a problem from as wide a perspective as possible. Projects are not viewed in isolation from other important factors. Appropriate technology is concerned with development that grows in a logical, systematic and constructive way. The necessary infrastructure to support the technology should develop in concert with the technology itself.

There are a number of similar terms that are used for or interchanged with appropriate technology, although one should be aware that they are not all the same. Jequier and

Blanc (1983) mention such terms as alternative technology, capital-saving technology, community technology, intermediate technology, low-cost technology, socially appropriate technology, soft technology and village technology.

Definition of Appropriate Technology

There are many definitions of appropriate technology. Jequier and Blanc (1983) define it as:

> the generic term for a wide range of technologies characterized by any one or several of the following features: low investment cost per work-place, low capital investment per unit of output, organizational simplicity, high adaptability to a particular social or cultural environment, sparing-use of natural resources, low cost of final product or high potential for employment. (p. 10)

The Brace Research Institute (1983) defines appropriate technology as "...technology which is most suitably adapted to the conditions of a given situation. It is compatible with the human, financial and material resources which surround its application" (p. A1). Technology is thought of primarily as tools, machines and other hardware, but also involves the skills and procedures for doing things.

Long (1978) defines appropriate technology as:

> 1) It is not primitive or obsolete, but is economic, culturally congenial and ingenious in its design;

> 2) It should represent the least-cost solution, taking into account the factor costs of production;
>
> 3) Labour intensiveness is a necessary condition;
>
> 4) It is defined by low capital investment per worker, preferably in small enterprises that can be managed with local talents. (pp. 43,44)

Robinson (1979) describes appropriate technology with more emphasis on the economic aspects. He said an efficient appropriate technology is:

> ...one which makes possible the production of a given good at a price not exceeding the current world price when:
>
> 1) all factors of production are valued at prices that reflect their relative scarcities and opportunity costs and which will permit the full employment of all available supplies of all factors;
>
> 2) the exchange rate is such that there is a balance of payments with this level of demand and activity, when allowance is made for a normal inflow or outflow of capital;
>
> 3) the rate of interest, or discount is consistent with a balance between earnings and investment at this level of near full employment of all factors of production. (p. 26)

Appropriate technology is an efficient technology. Robinson (1979) sees technology as a combination of a number

of factors of production such as various qualities of labour and management, capital in machinery and buildings and working capital in materials in various phases of production (p. 27).

Roman (1980) describes appropriate technology as one which "would contribute to the improved social and economic conditions of a society by developing technological capabilities environmentally suitable in consonance with need, resources, labour and capital" (p. 138).

Kamenetzky (1978) summarized appropriate technology:

> ... as being sensitive to human needs, and in concert with such needs, optimizes the use of indigenous resources, protects the environment, minimizes the frustrations and unpleasant aspects of work, provides for increased worker and consumer participation in decision processes, encourages equitable income distribution, and reduces physical risks to workers. (pp. 138,139)

As can be seen from these various definitions consideration is given to a number of different elements. Appropriate technology is flexible, it seeks to accommodate human needs and resources. It also accounts for economic factors and material resources as well as environmental and cultural considerations.

The economic aspects of appropriate technology are the heart of many of these definitions. If the economic benefits

fail to materialize the social, cultural, environmental and other problems are not likely to be solved. Economics in the concept of third world development should start at the simple, cheap and small level because people are usually very poor. The goal is to develop income generating work places and jobs. This initial stage of income generation should be designed to grow so that the benefits of income spread to more than just a few.

A case study reported in A Handbook on Appropriate Technology (Brace Research Institute, 1983, pp. B8:1-3) illustrates an appropriate technology approach to the introduction of farm implements.

Bangladesh farmers were left with nothing but small parcels of land after a cyclone and civil war had devastated their farms. The farmers needed implements and seed to start again. The project which developed with the help of the Canadian Hunger Foundation was designed to meet the felt needs of the co-operatives and communities involved. Priority was given to implements for paddy rice farming. The selection of two implements, a weeder and a pedal thresher was based on several appropriate technology considerations. The introduction of new strains of rice required better threshing than traditional methods could provide. The tools had to be simple and easily operated by poor farmers. Manual power was chosen so as to keep the farms labour intensive and so the operation and maintenance would be cheap. The

equipment was designed so that it could be manufactured locally therefore providing jobs, generating income, facilitating repairs and minimizing costs.

The resulting implements have been promoted through cooperative training sessions and have been successful in raising net farm incomes while reducing dependence on village money lenders. Considerable business has been generated for small-scale industries.

The use of local resources and the proper allocation of factors of production such as labour and capital are especially important in development situations.

Criteria of Appropriate Technology

There are a number of characteristics and criteria that help to describe appropriate technology. The Brace Research Institute (1983) gives a number of characteristics or elements which will likely be common in appropriate technology applications in rural areas:

1) Trade and contact with the modern sector is encouraged only to the extent that they support the rise and development of local skills and resources,
2) As much as possible locally available material, human and energy resources are used,
3) Characterized by decentralized small scale production units and renewable energy resources,
4) Generates meaningful jobs and accommodates displaced workers in a productive capacity in some related area.

It is labour intensive.

5) Recognizes that different countries and communities have differing cultural backgrounds, priorities and motivational values into which technology must be integrated.

6) Foreign capital is a complement to not a replacement for local capital.

7) It is a technology which can be adequately operated and maintained using local skills, materials and auxiliary facilities.

8) Characterized by being simple, low cost and affordable by the people.

9) Control over the price and benefits so that they accrue to the producers.

10) Flexible enough to be easily modified in response to changing conditions or unforeseen difficulties.

11) Compatible with the local ecology.

12) Generates concomitant research and development.

13) Needed and acceptable to the people who are going to use it. (pp. D2:2-4)

Several other criteria may be added to this list. Harrison (1980) notes that the service or product produced by the technology should be affordable by low income earners. Singer (1977) suggests that appropriate technology should promote income redistribution in favour of the basic needs of poor. Riskin (1979) emphasizes the need for strong

linkages both forward and backward especially in agriculture. He also supports the Brace Research Institute's position on the reduction of dependence by rural areas on centrally produced or purchased material. The technology should also be designed and built so that it is able to exist and operate satisfactorily in an environment of low and variable quality standards (Higgins, 1959). Jequier (1979) says that systems-independence is an important aspect of technology. The more dependent a technology is on supporting services the more likely it is to be used by the relatively wealthy. Jequier (1979) also says appropriate technology should have an image of modernity to enhance its desirability. The degree of risk inherent in the technology is also an important criterion especially when it is aimed at poor people (Jequier, 1979). Technology brings with it financial risks as well as the risk which may result in the cultural context. The evolutionary capacity of a technology, that is its ability to create innovations and to evolve or progress, is also a criterion of appropriateness (Jequier, 1979). Sagasti (1979) considers self-reliance and the ability of a technology to be self-sustaining as important criteria. It must be able to generate income and not be dependent on foreign aid.

This extensive list of criteria will be subject to the perspective of those involved in development whether it is national, regional or international. Reddy (1979) adopts a

general view of appropriateness of development which is environmentally sustainable and says it will meet three objectives: "...satisfaction of basic human needs, endogenous self-reliance through social participation and control and harmony with the environment" (p. 173).

Apedaile (1984) when rating three conventional transport systems in Nepal developed a list of conventional and situational specific criteria for appropriate technology:

1. Emphasizes local materials
2. Decentralization of production units
3. Integration with motivational values
4. Compatibility with local skills
    a) operation
    b) maintenance
    c) repair
5. Control over pricing and benefits leakage
6. Concomitant research and development
7. Affordability of services by low income people
8. Promotion of income redistribution
9. Potential for successful continuing innovation
10. Tight linkages to agriculture
11. Reduction in dependence on the centre
12. Scale neutrality for access
13. Viability with low and variable materials standards
14. Minimum reliance on engineers

15. Local feeling of ownership
16. Contributes to learning process
17. Integration of human settlements
18. Influence on migration
19. Environmental compatibility
20. Economic diversification
21. Maintenance attitudes and capabilities
22. Flexibility of capacity with demand requirements.

(pp. 5-12)

The criteria of appropriate technology include technical, ecological, political, socio-cultural and economic factors. A strong bias to village life and a simple rural life-style is evident. Most of the criteria are compatible with one another but as technology develops and becomes more complicated the simple and low cost criteria become less feasible. The criteria which emphasize small-scale, low cost and simple design seem to be restrictive in nature to early stages of development and eventually come in conflict with the evolutionary nature of technology.

Technology and its Transfer

Singer (1977) describes technology as "...the skills, knowledge and procedures for providing useful goods and services..." (p. v). Technology, including mechanical aspects, exists at all levels of development and is not exclusive to developed countries. Less technically sophisticated but often suitable technology is utilized in

developing countries. According to Singer (1977) the obvious determinant of an areas' appropriate technology "...is its factor endowment - that is, the relative proportion in which labour, capital, land, skills and natural resources are available to the economy" (p. 1). Typically a developing country such as Nicaragua would suffer from a shortage of skills and capital while having a relative surplus of unskilled labour. Therefore the choice of farm mechanization through tractors and other equipment would seem dubious at first glance.

Less developed countries usually obtain aspects of technology from more developed countries. Dahlman and Westphal (1983) note that there are various ways to obtain technology. It can be provided by foreigners, purchased from foreigners or acquired by indigenous efforts to translate foreign technology (through acquiring knowledge, copying or adaptation). Indigenous technical knowledge is a major source of technical adaptation and innovation in most countries as well.

Hayami and Ruttan (1971) give three phases of technology transfer: 1) material transfer (machines, seed, fertilizer), 2) design transfer and 3) capacity transfer (knowledge and production) (p. 175). The country of Nicaragua is transferring technology in the form of farm machinery. Jedlicka (1985) likens the first phase to "...Rostow's first stage of development where technical

abilities are so limited that even parts salvage is negligible" (p. 324). Nicaragua has progressed past the limited salvage point but not into the second phase.

Nicaragua is an example of a country importing technology in an attempt to improve the 'economies of scale' in agriculture and therefore the production of food and export items. Reddy (1979) says that these 'economies of scale' are usually only obtained when the required infrastructure of energy, raw materials, spare parts, transportation and technical skills are available. The result if these are unavailable is the under utilization of capacity, a situation which exists on the co-op farms studied in Nicaragua (Apedaile, Demarais and Peterson, 1989).

According to Dahlman and Westphal (1983) there is the notion that technology transfer gives recipients the:

> ...capability to operate a technology, to expand existing productive capacity or establish new capacity and the capability to develop new methods of doing things. The capability to operate a technology is different from the ability to develop the means of implementing it. Similarly, having the capacity to implement a technology is different from having the capability to create a new one. (p. 349)

The key strategy when technology is transferred from abroad is how to build upon the technology to stimulate local

capabilities in some areas. The sequence of accumulation of capabilities is most important since they cannot all be acquired at once. The infrastructure system of parts, fuels, lubricants, repairs and other essential components needs to develop together to result in successful mechanization, however this has not happened on the co-op farms.

Role of Education

The transfer of technology and the ability of a country to adapt technology and make it work is to a large degree dependent on the education, knowledge and skills that the people have. Frederick Harbison (Todaro, 1977) has said:

> Human resources...constitute the ultimate basis for wealth of nations. Capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build social, economic and political organizations, and carry forward national development. Clearly, a country which is unable to develop the skills and knowledge of its people and to utilize them effectively in the national economy will be unable to develop anything else. (p. 289)

According to Murrell (1984) man should be using technology to meet his needs and training is critical to develop, control and use technology.

The situation in Nicaragua is typical of many less developed countries. The recipients of technology are in

most cases adults who are illiterate or very poorly educated. They have very little mechanical skills and farming experience. The introduced technology is very complex and difficult to understand. Sinei (1987) points out that complex innovations requiring the development of new skills will be adopted less rapidly than less complex ideas.

The Farm Brigade Project is attempting to provide non-formal adult education in the circumstances described above. Stone (1983) states that "... nonformal education is goal-oriented, functional, vocationally directed, relatively short in duration and flexible" (p. 298).

Axinn (1977) says that there are seven functions in every rural social system: supply, production, marketing, personal maintenance, learning, health care delivery and governance. These are linked together and change in any one of these will affect the others. The learning component plays a unique role as facilitator of transactions on all linkages and serves to enhance frequency, fidelity and capacity of the linkages (p. 489). Axinn (1977) also notes that rural education which is locally controlled, practical and applied, problem posing and focused on functional specialization can accomplish much (pp. 494,495).

According to Wharton (1965) general education:

> ...pushes back cultural prohibitions, broadens the notion of what is possible, motivates, induces frustration which may lead to activity resulting in

> economic consequences, improves rational thinking and problem solving, increases inquisitiveness which heightens self-discovery, influences goals and activities and provides a wider knowledge of alternatives. (pp. 206,207)

Basic education improves farmers' skills such as reading, writing and arithmetic which are helpful in most other areas of life.

Educational activities have a role in developing human capital. Wharton (1965) says that "the provision of new 'developmental knowledge' to farmers must always be mindful of the general need to balance the introduction of human and non-human capital, especially in early-stage agriculture (p. 225). He also suggests that in a low income country "the marginal product of non-human capital is zero or close to zero as long as the level of human capital input is fixed" (p. 226).

It would appear from these observations that education's role is to develop the human skills and resources in sequence with the introduction of technology. The gap between human skills and introduced technology is usually large in third world countries, especially in rural areas.

The World Bank (1980) suggests that for adult education to be effective it must be conducted by competent teachers and must address specific felt needs. Felt need is one of

the key criterion in appropriate technology. The seven functions mentioned by Axinn also address some of the factors that will be affected when a technology such as tractors is introduced to a rural area. Therefore when selecting the criteria to evaluate the Brigade training project these educational aspects and linkages must be considered.

Selected Criteria

Since the criteria that apply to appropriate technology are very location-specific, it is necessary for the purposes of this project to select criteria which could be used to evaluate the Farm Brigade Project on the co-op farms in Nicaragua. The criteria were chosen because they emphasize the need of the project, the use of local resources and the long term sustainability, in social and economic terms, of the training. The criteria, which are objective, indirectly evaluate the education component by indicating how human skills, knowledge and economic factors were developed through training. The criteria measure the end results rather than the process of training.

Eight criteria were selected from a potential of over twenty. They are:

1) The project meets a felt need.

2) The emphasis is on the use of local materials.

3) The emphasis is on the use of local skills and resources of the people.

4) The project is characterized by decentralized, small-scale units such as maintenance and repair facilities.

5) The project generates meaningful jobs for local people.

6) The project diminishes the influence of external cultural domination and encourages community participation.

7) The project can be adequately operated and maintained using local skills, materials and facilities.

8) The project is sustainable without foreign aid and generates income.

The criteria centre around the concept of developing the necessary skills and infrastructure to adapt mechanization to the co-op farms. Several criteria bring the important economic issues to the forefront. The criteria also focus on the socio-cultural aspects of the Brigade training program. An important consideration in selecting the criteria was their compatibility.

The introduction of mechanized farming was a political decision made by the Nicaraguan government. The adaptation to this and the results in the community can be observed. The role of the Farm Brigade training program can also be evaluated in the light of the above criteria of appropriate technology.

Chapter Four

Method

Questionnaire Design

The Farm Brigade project was evaluated by the use of a structured questionnaire called Oxfam Canada Farmers' Brigade Evaluation: Maintenance Skills Training, Evaluation by Nicaraguan Farmers (Appendix A). The questions were developed from the eight criteria of appropriate technology that were applicable to the situation in Nicaragua. The criteria together with the questions that were developed to obtain evidence about them are in Appendix C. Several additional questions were included in a questionnaire called Questions for Nicaraguan Farmers and Officials which was part of an evaluation of the Oxfam Farmers' Brigade Project in Nicaragua (see Appendix B for selected questions).

A mixture of yes-no, scale rating and opened-ended questions were used. One to three questions were asked relating to the criteria to generate sufficient information to evaluate the Brigade training and the appropriateness of tractorization. Personal information about trainees duties before training and at the time of the survey helped to establish what the Brigade training had accomplished.

Data Collection

The interviews for this evaluation were done in conjunction with a larger evaluation of the Oxfam Farmers' Brigade Project done for Oxfam Canada and the Farm Brigade.

The team consisted of Leonard Apedaile, Gordon Peterson and Annette Demarais who visited Nicaragua in February 1989. They along with a Canadian interpreter conducted the personal interviews of Nicaraguan farmers.

Six co-op farms where the Brigade had conducted training were visited and ten trainees were interviewed along with six leaders in the co-ops. One to two trainees were interviewed at each co-op. The co-op farms were: German Polmares, Casa Blanca, Palo Verde, Guillermo Ramirez, Ramon Salinas and La Estancia, all in Region 1 near the Honduran border (Figure 1).

Modifications to the questionnaire were made in the field since a pretest had not been possible. The major change was to shorten the 10 point scale to 4. The questions were translated into Spanish before the interviews with particular attention to ambiguity and consistency. Ten out of a possible thirty-seven trainees were interviewed. It was not possible to interview others because they were unavailable at the time due to circumstances such as military duty and farm responsibilities.

Chapter Five

Analysis of the Data

Method

The data was analyzed using simple nonparametric statistics. Ten trainees and six co-op leaders were interviewed and most results are reported as mean ratings which were converted into a percentage rating where appropriate. The sample of ten is representative of the total trainee population of thirty-seven. The trainees were not selected randomly but all who were available were interviewed. The data from the eight appropriate technology criteria were summarized and the Brigade's performance was rated for each of these criteria.

Results

The ten trainees (9 male, one female) ranged in age from 22 to 36 years. The mean age was 29.5 years. The education level was very low with three having no education and only two having completed grade six (Table 1).

Table 1

Trainee Education Level

Level	# of Trainees
None	3
Adult Education Program	1
Third Grade	2
Fourth Grade	2
Sixth Grade	2
Total Replies	10

The mechanical training of the trainees was also low and only two had taken a government sponsored course. At the start of training about one third of the trainees had responsibility for tractor operation or maintenance (Table 2). At the time the survey was done only 22% had maintenance responsibilities (Table 3).

Table 2

Equipment Trainee Responsible For At Start Of Training

Equipment	# of Trainees
None	7
One tractor	2
Two tractors	1
Total Replies	10

Table 3

Maintenance Responsibility Of Trainees

Time Responsible	% Yes Trainees
Start of training	33
After training	56
Present time	22
9 Replies	

Trainee attendance at sessions conducted by the Brigade was inconsistent and low as noted in Table 4. 80% attended 10 or less classes out of a possible 36.

Table 4

Training Session Attendance By Trainees

# of Sessions	% Attending	% of Total Classes
Less than 10	60	< 28
10	20	28
More than 10	20	100

10 Replies

The trainees were asked to rate their maintenance abilities after the Brigade training (Table 5). They felt somewhat competent to do daily maintenance but not 100 and 500 hour maintenance.

Table 5

Maintenance Ability of Trainees:
Self Rating

Task	Mean Competence	%
Daily maintenance	2.9	73
100 hr maintenance	1.6	40
500 hr maintenance	1.3	10

1 = unable to 4 = competent

The trainees were asked to rate their mechanical competence at the start and finish of training. Most trainees were fairly confident that they had learned a fair amount (Table 6). They indicated a great deal of interest in the training and a confidence that they could learn. Most had little mechanized farming experience.

Table 6

Mechanical Competence of Trainees: Self Rating

Ability	Mean Ability	%
Mechanical competence at start	1.2	30
Farming experience	2.8	70
Mechanized farming experience	1.3	33
Interest in training	3.7	93
Aptitude for learning	3.0	75
Mechanical competence at end	2.8	70

1 = very low to 4 = high

Many items that were necessary for farm machinery such as spare parts, filters, metal, nuts, bolts and tools were not readily available near the co-ops (Table 7). Nearby was considered to be less than an hour's drive.

Table 7

Locally Available Material For Machinery Maintenance

Items	Mean Availability	%
Tools	1.5	50
Spare parts	1.1	37
Lubricants	3.0	100
Filters	1.9	63
Nuts, bolts	1.8	60
Steel rods, angle iron	1.3	43
Sheet metal	1.1	37
Welding supplies	1.6	53
Electricity	2.2	73
Mean	1.7	57

1 = none to 3 = readily available

The Farm Brigade volunteers were scored 78% for their efforts to incorporate local ideas and knowledge into the

training program. They also adapted very well to the conditions they found on the co-op farms. Five of the eight trainees who responded had attempted to teach other co-op members to do maintenance.

The training program of the Farm Brigade did not result in new jobs being created nor had any businesses arisen as a result of the tractorization of the co-op farms. The questions concerning this were not asked since the lack of development was obvious.

56% of the trainees reported that there were enough skilled tractor operators on their co-ops. One co-op had sold its tractor since it could not get implements. Three co-ops benefited from newly trained tractor drivers, two did not and one had no need for drivers.

67% of the trainees reported that the Brigade training had increased the number of persons qualified to operate machinery. There was some concern that more training was needed with implements attached under field conditions.

The Farm Brigade repaired different types of equipment while on the co-op farms. The length of time these continued to run was variable. Irrigation equipment seemed to be the most likely to breakdown within a short time after repair.

Tables 8 and 9 give the officials' ratings of the Canadian Brigade members. The skills and experience of the Brigade instructors were rate at 94% while the appropriateness of the training was rated 90%. Only the

subject matter and the supply of spare parts was downgraded somewhat. The inability to speak Spanish or to speak it fluently was noted as a problem. The Brigade members fit well into the community and only one problem which led to jealousy over the distribution of souvenir hats was mentioned.

Table 8

Brigade Instructors' Skills:
Officials' Rating

Skill	Mean	%
Teaching ability	3.8	95
Mechanical skill	4.0	100
Mechanical experience	4.0	100
Ability to diagnose	NA	-
Ability to make do	3.2	80
Mean	3.8	94

1 = low to 4 = excellent

Table 9

Appropriateness of Brigade Training:
Officials' Rating

Training Component	Mean	%
Subject matter	3.0	75
Method of instruction	3.7	93
Supplies from Canada	3.3	83
Spare parts	3.0	75
Trainees farm experience	3.6	90
Orientation of Canadians	4.0	100
Interaction of Canadians	4.0	100
Size of group	3.5	88
Cultural adaptation	4.0	100
Interpreter	3.8	95
Mean	3.6	90

1 = unsuitable to 4 = suitable

The officials of each of the six co-ops were asked to evaluate the main objectives and activities of the Brigade. The officials rated friendship as the most important objective with training as the second most important (Table 10). The most important activity of the Brigade was parts supply while maintenance training was rated as least important (Table 11).

Table 10

Brigade Objectives:
Officials' Replies

Objective	Frequency	%
Supply spare parts	1	17
Repair equipment	2	33
Friendship	4	67
Economic improvement	1	17
Help	1	17
Learn about machinery	1	17
Training	3	50
Build a shop	1	17

Multiple answers allowed

Table 11

Importance of Brigade Activities:
Officials' Ranking

Activity	Mean Ranking	Order
Maintenance training	2.3	1
Repair	3.0	3
Parts supply	4.4	5
Tool supply - farmers	4.0	4
Establishing repair shops	3.0	2

1 = least important to 5 = most important

The Farm Brigade training did little to lessen the dependence of the co-ops on foreign spare parts, distant shops or the Brigade itself (Table 12). The Mobile Repair Shop was used in the training but the co-ops did not appear to be dependent on it.

Table 12

Reduction Of Co-op Dependence On Others Due To Brigade Training: Officials' Evaluation

Dependence Area	% Yes
Other farms	50
Foreign parts	17
Distant government shops	0
Transportation	50
UNAG	NA
Foreign technical assistance	NA
Foreign financial assistance	NA
Oxfam Farm Brigade	17
Mean (NA not answered)	33

Chapter Six

Interpretation of the Results

The results indicate several initial problems that the Brigade faced when it started to do maintenance training: lack of felt need, illiteracy and demechanization.

The Brigade training project does not appear to have been a priority or a felt need with the Nicaraguan officials, co-ops or trainees. Maintenance training was ranked as the least important activity of the Brigade. The Canadians on the other hand saw maintenance training as a pressing need. The interaction of the Brigade, UNAG and the co-ops did not result in suitable and motivated trainees in some cases. Difficulties, perhaps of a cultural nature, within the co-ops may have also contributed to this problem. Most trainees did not have responsibility for equipment maintenance or driving before training or by the time the survey was completed one and two years later. Tractor driving is a prestigious job and usually is done by older men. The trainees may have felt from the start that a mechanical assignment was unlikely and were therefore not motivated to attend the training sessions.

The Canadian farmers in the various Brigade groups were training farmers who were for the most part functionally illiterate or nearly so. Basic skills such as reading, writing and arithmetic are necessary as a foundation upon which technical knowledge can build (Wharton, 1965). The

Brigade faced an uphill battle when the skills of the trainees were so low. Even though the trainees felt they had learned a great deal in the sessions their ability to retain this, especially if they were not routinely doing maintenance, was very limited. Since local skills were so limited the training was largely dependent on the Canadians' presence and reinforcement and additional training did not take place for the majority of each year.

Demechanization of some of the co-ops is the third factor which appears to have affected the overall outcome of the Brigade training program. One co-op where training had taken place sold their tractor since they could not afford to purchase implements (Apedaile, Demarais and Peterson, 1989). The effort spent in training without realizing the economic situation resulted in a misallocation of resources.

Inspite of the problems the brigades encountered the members fit well in the community and were scored high for their skills in teaching, repairing and adapting to the culture. However a lack of fluency in Spanish was a problem which both Canadians and Nicaraguans noted. The morale boost the Brigades gave seemed to be more important than the training.

Table 13 summarizes the rating of the Brigades' training program according to the eight criteria of appropriate technology.

Table 13

Brigade Appropriate Technology Rating

Criteria	Rating (100% maximum)	Basis for rating
1. Emphasis on local material	57	Local material not readily available
2. Emphasis on local skills and resources	71	Attempted use of local skills
3. Decentralized small-scale units	0	None had developed
4. Generates meaningful jobs	0	None had developed
5. Diminishes external cultural domination	33	Dependence on Farm Brigade
6. Operated and maintained locally	61	Increase in qualified tractor operators
7. Sustainable without foreign aid Income generating	0	No income generation Dependent on aid
8. Meets a felt need - Ranked least important out of five		

The mechanization of Nicaraguan co-op farms with tractors and other equipment has proceeded more rapidly than the development of the needed infrastructure to supply tools, spare parts and other essentials (Criterion 1). Nicaragua is almost totally dependent on imported material. This has caused problems since Nicaragua is short of foreign

exchange. Transportation was marginal in some areas, the Contra war was costly and the U.S. embargo has hurt. These bottlenecks in the supply of essential items have hindered the tractorization effort. Governments often make the price of tractors attractive through subsidies, tax concessions, and controlled exchange rates (Ellis, 1988). The low price encouraged the rapid adoption of tractors in Nicaragua. The gradual development of services has not kept pace with the spread of tractors and other motorized units in Nicaragua. Problems of high operating costs and a lack of essential items to keep the machinery running would have been less serious if tractors had been introduced gradually.

It is likely that the introduction of tractors to the co-ops has not resulted in a net increase in productivity. Tractors are more likely a direct substitute for human labour or animal power rather than increasing the net incomes of the co-ops and they are costly to run due to imported spare parts, fuel and maintenance requirements (Ellis, 1988). The tendency of Canadians who are familiar with mechanical systems is to help the Nicaraguans with spare parts, tools and whatever is needed to make things work. Appropriate technologists would see this as a short term solution which does not deal with the issue of the inappropriateness of the tractors. The training project was dependent on the spare parts and tools which the Brigade supplied since maintenance supply facilities were at least

an hour's drive away and most farms lacked vehicular transport.

The Brigade was ranked favourably for their efforts to incorporate local ideas and knowledge into the training program (Criterion 2). Over half of the trainees responded by attempting to pass on what they had learned to others, indicating that the training was transferrable. Good use was made of the equipment available on the co-ops to teach maintenance skills.

The Brigade training effort did not consider fully the economic implications of mechanizing agriculture or how the Brigade could help to create income generating businesses and jobs (Criteria 3 and 4). Small-scale businesses had not developed due to tractorization nor had any meaningful jobs been created. The lack of rural development surrounding the co-ops and the lack of local material, human resource development and businesses indicates the inappropriateness of the tractorization scheme. Maintenance training was initiated inspite of these circumstances. The possibilities of adapting tractors, developing ways of extending the lives of filters and parts fabrication were not explored. The training program while trying to meet immediate pressing needs did not help to create income generating jobs which could help the co-ops to purchase equipment, parts, repairs and other supplies.

The education and training effort seems to have been

dominated by Canadian cultural values which Brigade actions encouraged (Criterion 5). An appropriate technology approach seeks to lessen this external cultural influence. Brigade training was largely separate from any existing programs in Nicaragua and was only functional when Brigade members were present in the country (two to three months each year). The training did not focus on developing Nicaraguan instructors but was more general in nature. The short term nature of the Brigade program (2 to 3 months each year) did not allow time for appropriate concepts to develop.

For a technology to be appropriate it should result in equipment that can be operated and maintained using local skills, materials and facilities (Criterion 6). The Brigade did help to train needed tractor operators in 50% of the co-ops surveyed. The skills of the trainees developed and improved but the Nicaraguans also recognized their need for more training, especially in the field, with implements attached. Government and private shops which were distant from the co-ops were in many cases the only place to have work done or to get supplies.

The lack of local material, skills, resources, instructors and economic development has resulted in a tractorization effort which cannot survive without foreign aid (Criterion 7). Income generation a key to reducing foreign domination appears to be totally lacking in the co-op farms and the surrounding area. The co-ops leaders

recognized that they were still very much dependent on the Brigade and others to support mechanization. The Brigade training increased the dependence of the co-ops on foreign spare parts.

Although the Brigade was rated low in terms of appropriate technology criteria the encouragement provide and solidarity developed with Nicaraguan farmers was important to the co-ops.

Chapter Seven

Conclusion and Observations

Conclusion

The evaluation was based on a small sample size and a questionnaire which was not pretested but performed well. The evaluation of the Oxfam Farmers' Brigade Project focused only on the maintenance training aspect. The sample was representative of the total trainee population. The lack of rural development in Nicaragua, the Contra war and the short term nature of the brigade groups' visits to Nicaragua are factors that adversely affected the project. These circumstances were beyond the control of the Brigade but did influence the evaluation.

The Brigade education project was rated low when it was evaluated by the eight criteria of appropriate technology. However when it was rated by former Brigade members (Apedaile, Demarais and Peterson, 1989) it was considered to be a success. Nicaraguan co-op leaders and farmers viewed the training and other Brigade activities as helpful and were encouraged by the solidarity with Canadians. An appropriate technology approach to development is concerned with a Nicaraguan driven process that is suitable to the long term good of the people. The Canadian approach shows that they have not understood development in terms of appropriateness. Success was thought of in terms of parts supplied, manhours spent and friendships developed.

The annual changes in the Brigade's objectives may have led the Brigade into areas that they were ill-prepared for. Most Brigade members were farmers, not educators and their skills were taxed trying to teach maintenance to farmers who were mostly illiterate and who spoke Spanish not English. Shop building and equipment repair were more natural endeavours for most Brigade members.

The Nicaraguan perception of the Brigade's usefulness points out that maintenance training was not a high priority but friendship and parts supply was. It is largely for this reason that the Brigade should examine the need for a training program. Appropriate technology is complicated and social, cultural, natural and human resources as well as the economics must be considered.

Two critical issues which should not be ignored in a development situation such as found in Nicaragua are the need for improvement in basic education and the desperate need to generate income. While economic productivity is only a part of appropriate technology, it is a driving force behind development for poor people.

Observations

The Brigade was working in a situation where government action had resulted in inappropriate technology. It is not clear if a training program such as the Brigade's could eventually overcome inappropriateness nor is it clear if the criteria of appropriate technology could ever be fully met.

Appropriate technology is to a certain extent idealistic and in an increasingly international world it is more difficult to be self-sufficient and not influenced by other cultures. Nicaragua was also diverting manpower and financial resources to fight a war, resources which could have helped in development.

The Brigade training program would not likely be able to meet all the criteria of appropriate technology due to several factors. The general education level of the co-ops members was very low and would have to improve to some extent to allow for the development of Nicaraguan run shops and businesses. The influence of the Contra war focused farmers' priorities on survival not maintenance repair. The Brigade project is fairly new and it may be unfair to assume it could meet all the criteria in such a short time, nor was it designed with appropriate criteria in mind.

The paradox between success as measured against criteria of appropriate technology and of Canadian perceptions of development may be related to two interrelated factors. The goals underlying the two sets of criteria are different. Canadians measure success in terms of Canadian technology while appropriate technology measures success in term of suitable technology. Lack of an understanding of 'real' development also contributes to the paradox. 'Real' development in appropriate technology terms is self-reliant and sustainable development which is in

harmony with the social, cultural, environmental and economic realities of the region or country. 'Real' development in popular terms means changing the situation to solve a problem, often in the context of the Canadian experience.

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Appendix A

OXFAM CANADA FARMERS' BRIGADE EVALUATION

Maintenance Skills Training

Evaluation by Nicaraguan Farmers: February, 1989

1. Personal Data

a) Age ______________ Sex: Male Female

b) Education ____________________

c) Mechanical Training ________________________

d) Equipment Responsible For ______________________________________

____

____

2. Approximate number of classes attended? __________________________

3. Rate yourself on the following basis following your mechanical training.

List of Maintenance Tasks	Competent to do task on your own	Competent with help of another	Still need direction	Unable to perform task
a) daily equipment maintenance training	1	2	3	4
b) 100-hour maintenance training	1	2	3	4
c) 500-hour maintenance training	1	2	3	4
d) annual maintenance training	1	2	3	4

4. Please grade, on average, your ability on the following basis?

	Very Low			High
a) mechanical competence at the start	1	2	3	4
b) farming experience	1	2	3	4
c) mechanized farming experience	1	2	3	4
d) interest in training	1	2	3	4
e) aptitude for learning	1	2	3	4
f) mechanical competence at the end of training	1	2	3	4

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5. Did you have ongoing responsibilities for equipment maintenance?

	Yes, had a job	No, didn't have a job
When you started training?	1	2
After you completed your training?	1	2
At the present time?	1	2

6. Are materials available locally which can be used in mechanical maintenance and repair?

	None		Readily
a) tools	1	2	3
b) spare parts	1	2	3
c) lubricants	1	2	3
d) filters	1	2	3
e) nuts, bolts	1	2	3
f) steel rods, angle iron,	1	2	3
g) sheet metal	1	2	3
h) welding supplies	1	2	3
i) electricity	1	2	3

7.1 Has the Farm Brigade training incorporated local ideas and knowledge into their training program?

Not At All			Most Of The Time
1	2	3	4

Please Explain -

7.2 After the Farm Brigade left did you give instruction in mechanical training to others?

Yes	No
1	2

Please Comment -

8.1 Has the Farm Brigade maintenance and repair training created new jobs?

	Yes	No
For you?	1	2
Relatives?	1	2
Others you know of?	1	2

How many jobs? ______________________

If "Yes" describe jobs -

8.2 Did the Canadian farmers adapt well to the conditions on your farm?

No			Well
1	2	3	4

Please Explain:

9.1 Are there enough skilled tractor operators to meet the needs on your farms?

Yes	No
1	2

Comment on factors affecting this-

9.2 Has the Farm Brigade training increased the number of persons who are qualified to operate machinery?

Yes	No
1	2

10. Have you received visits from the mobile shop during or since the Canadian training?

Yes	No
1	2

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11. For how long has equipment repaired by the Farm Brigade continued to operate after the Farm Brigade volunteers left your community?

	Small Tractors	Large Tractors	Pumps	Other
Less than 6 months	1	1	1	1
6 months to 1 year	2	2	2	2
1 to 2 years	3	3	3	3
Indefinitely	4	4	4	4
Not applicable	5	5	5	5

Advice?

Appendix B

EVALUATION OF OXFAM FARMERS' BRIGADE PROJECT IN NICARAGUA

February 1989

Questions for Nicaraguan Farmers and Officials

1. What have been the main objectives of the Farmers' Brigade projects?

a)

b)

c)

2. How would you describe the following skills and experience of Farm Brigade instructors?

	Low			High
a) teaching ability	1	2	3	4
b) mechanical skill	1	2	3	4
c) mechanical experience	1	2	3	4
d) ability to diagnose mechanical problems	1	2	3	4
e) ability to make do	1	2	3	4

3. Describe the appropriateness of the following aspects for the needs of the co-op farms.

	Unsuitable			Suitable
a) subject matter	1	2	3	4
b) method of instruction	1	2	3	4
c) Supplies from Canada	1	2	3	4
d) spare parts	1	2	3	4
e) trainees farm experience	1	2	3	4
f) orientation of Canadians	1	2	3	4
g) interaction of Canadians	1	2	3	4
h) size of group	1	2	3	4
i) cultural adaptation	1	2	3	4
j) interpreter	1	2	3	4

4. The Mobile Shop played a role in facilitating the Maintenance Skills Training project.

Was the shop available when needed?

5. Rate the importance of the following Farmers' Brigade activities in order of least important to most important

a) maintenance training ___

b) repair ___

c) parts supply ___

d) tool supply for farmers ___

e) establishing repair shops ___

6. Has the Farm Brigade maintenance and /or repair training received lessened dependence on:

	Yes	No
a) other farms	1	2
b) foreign parts	1	2
c) distant government shops	1	2
d) transportation	1	2
e) UNAG	1	2
f) foreign technical assistance	1	2
g) foreign financial assistance	1	2
h) Oxfam Farm Brigade	1	2

7. Have the Farm Brigade projects created any problems in the community?

Appendix C: Appropriate Technology Questions

1) Project meets a felt need.

   a. What have been the main objectives of the Farmers' brigade projects? (open-ended)

   b. Rate the importance of the following Farmers' Brigade activities in order of least important to most important (maintenance training, repair, parts supply, tool supply for farm, establishing repair shops).

2) Emphasis is on the use of local materials.

   a) Are materials available locally which can be used in mechanical maintenance and repair?

   b) Did the Farm Brigade make use of local materials in their training program?

3) Emphasis is on the use of local skills and resources of the people.

   a) Has the Farm Brigade training incorporated local ideas and knowledge into their training program?

   b) After the Farm Brigade left did you give instruction in training to others?

4) Characterized by decentralized, small-scale units (maintenance and repair facilities).

   a) Have new farm activities, mechanization or local businesses been encouraged as a result of co-op farm mechanization, private farm mechanization, mechanical training projects by Canadians, mechanical training

projects by other foreigners, government programs, U.S. blockade?

b) What new farm activities, mechanization or businesses have been started in connection with the Canadian farm mechanization projects in the last four years?

c) Are you more or less dependent on centrally located (distance) shops for mechanical repairs?

d) Were local businesses in the area affected by the Farmers' Brigade projects able to manufacture and supply spare parts?

5) Generates meaningful jobs for local people.

a) Has the Farm Brigade maintenance and repair training created new jobs?

b) Have businesses related to tractor maintenance and repair gone bankrupt in the last four years?

6) Diminishes the influence of external cultural domination: encourages community participation.

a) Has the Farm Brigade maintenance and/or repair training you received lessened your dependence on: other farms, foreign spare parts, the government, transport, UNAG, foreign technical assistance, foreign financial assistance, others?

b) Have the Farm Brigade projects created any problems in the community?

7) Can be adequately operated and maintained using local skills, materials and facilities.

    a) Are there enough skilled tractor operators to meet the needs on your farm?

    b) Has the Farm Brigade training increased the number of persons who are qualified to operate machinery?

8) Sustainable without foreign aid - income generating.

    a) For how long has equipment repaired by the Farm Brigade continued to operate after the Farm Brigade volunteers left your community?

    b) In your opinion when should the Farm Brigade training program be phased out?

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APPROPRIATE TECHNOLOGY:
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FARMERS' BRIGADE IN
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